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ABSTRACT

The shortcomings of current research on student attrition are reviewed, and ways are described in which multiple regression, path analysis, and a recursive causal model can be used to better understand attrition. A review of the research shows that past theoretical models lack an adequate definition of variables which have resulted in their being unsuitable for path analysis, or combined in single regression variables which are temporally ordered. A causal model is proposed that contains background variables, organizational determinants, intervening variables, personal determinants, environmental determinants, and a dependent variable. Additionally, the model takes into account a set of control variables used both to select a homogeneous subpopulation and to test for an interaction effect in the data set. Each of the causal model elements are discussed and two problems with the model are noted. A graphic illustration of the causal model is provided, along with an extensive bibliography, and a glossary of the variables. (Author/PHR)

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PATH ANALYSIS: THE DEVELOPMENT OF A SUITABLE METHODOLOGY FOR THE STUDY OF STUDENT ATTRITION

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ABSTRACT

This paper briefly reviews the shortcomings of current research on student attrition, and describes how multiple regression, path analysis, and a recursive causal model can be used to better understand attrition. Past theoretical models lack an adequate definition of variables which resulted in their being unsuitable for path analysis, or combined in single regression variables which are temporally ordered. The causal model contains background variables, organizational determinants, intervening variables, personal determinants, environmental determinants, and the dependent variable. Used in conjunction with this model, path analysis and multiple regression produce statistics which show the relative contributior of variables net of all other variables, and the model's total explanatory power.

PATH ANALYSIS: THE DEVELOPMENT OF A SUITABLE METHODOLOGY FOR THE STUDY OF STUDENT ATTRITION

INTRODUCTION

Student attrition is a perennial problem for institutions of higher education (IHEs), and has been for more than sixty years (Summerskill, 1962). Attrition continues to be a problem to this day, both in the United States (Pantages and Creedon, 1978), and abroad (Mehra, 1973; Richling, 1971; Vaizey, 1971).

Discovering the reasons why students leave an institution has long been of interest to scholars in the field (Astin, 1975; Cope and Hanna, 1975; Heywood, 1971; Knoell, 1960; Pantages and Creedon, 1978; Sexton, 1975; Spady, 1970; Summerskill, 1962; Tinto, 1975). The lack of theoretical models useful in the study of student attrition has troubled researchers in the field (Knoell, 1960; Pantages and Creedon, 1978).

The purpose of this paper is: (1) to review and critique some of the current research on student attrition; (2) to describe the advantages of the use of path analysis and a causal model of student attrition in understanding the causes of student attrition; and (3) to describe a causal model of student attrition suitable for testing.

CRITIQUE OF PREVIOUS RESEARCH

Most of the past studies of student attrition have lacked a theoretical basis, with Spady (1971) being the most notable exception. The majority of the past studies used zero order correlations, and these have proven to be inadequate since the studies have few if any controls. Past studies have often been follow-up studies, asking students why they have left an institution, and therefore may lack validity. Furthermore, these studies tend to be one-time only studies of single

institutions, ignore the problem of spuriousness, and do not deal adequately with interaction effects. Also, studies tend to focus on a single class of variables which might be expected to effect student attrition, such as faculty/student interaction, or premarticulation characteristics, and therefore do not control for large sets of variables which have proven useful in examining student attrition in other studies. Finally, hazy definitions of "dropouts" have combined dropouts, stopouts, transfers, and voluntary and involuntary leavers into a single category.

Multivariate research has generally failed to produce an R^2 above .10. One of the notable exceptions to this is Spady's (1971) study of student attrition at the University of Chicago. Most studies, however, lack such success:

> In similar multivariate studies, Astin (1964), Panos and Astin (1968), Bayer (1968), and Mehra (1973) investigated the combined capacity of from 36 to 120 student input variables to predict withdrawal. These studies found that the multiple correlations of all significant variables account for about ten percent of the criterian variance. Time and again studies of the dropout conclude with statements similar to Bayer's. "The results of this study again illustrate our inability to predict with any great deal of accuracy which students will drop out of college and which will not." (p. 315). Yet these studies continue. (Cope and Hanna, 1975, p. 13)

The compilation of 120 independent variables to predict no more than ten percent of the criterian variance indicates that much of this past research has used uncertain measures linked by even more uncertain theoretical structures.

Another problem with multivariate studies is that they have generally neglected interaction effects, and thus have violated one of the assumptions of multiple regression. Terenzini and Pascarella's study of University of Syracuse students (1978) begins to demonstrate importance of assessing interaction effects in the study of student attrition. Stork and Burger (1978) reviewed several studies using discriminant analysis, and used discriminant analysis themselves in a study of student attrition at a college of liberal arts in a major metropolitan area. Although they are able to identify group membership correctly 62 percent of the time, their studies suffer from the same problems

as other studies using discriminant analyais. Terenzini and Pascarella (1978) have the same problems: discriminant analysis is essentially a descriptive statistic, although an improvement over zero order correlations. Discriminant analysis does not describe causal linkages, which may lead to an understanding of behavior, but simply identifies which variables most highly differentiate between groups; in this case, a dichotomous population of stayers and leavers. Secondly, discriminant analysis does not lead to an examination of interaction effects or to the indirect effect of a variable on a dependent variable.

Three studies are worthy of special attention. Tinto (1975) and Spady (1970) attempted to produce theoretical models of student attrition. One problem with these studies arises from the fact that the models are not recursive; i.e., temporal relationship of the variable is not "undebatable" or variables are simultaneous in effect. Spady's (1971) empirical study represents one of the most successful attempts to test an explanatory model of student attrition. But besides the lack of recursiveness in the theoretical model which he used, several of his measures were complex to the point of meaninglessness. For example, his operational definition of "normative congruence" contains five major clusters of variables. Therefore, no conclusions supporting or rejecting causality can be made, except in the grossest fashion. Also, both Tinto and Spady based their theoretical models of Durkheim's theory of suicide (1961). The link between dropping out of school and committing suicide is suggested as the theoretical basis for these models, but evidence is not provided indicating that dropping out of school is indeed analogous to committing suicide. As a result of the problems in the past studies, little is known about the causes of student attrition.

One final problem is that most studies do not distinguish between the determinants of student attrition (analytic variables) and the correlatives of student attrition (demographic variables). Correlates of the variables to which

student attrition is related. An illustration of a correlate would be race. Caucasions have a lower attrition rate than Blacks in most institutions of higher education. This is an empirical generalization, and indicates a correlation between race and attrition. It does not indicate, however, that race causes attrition. Determinants are analytical variables which are believed to produce variations in student attrition. Price (1977) makes an important distinction between correlates and determinants in developing his model of turnover in work organizations. He writes:

> "Determinants are analytical in variables which are believed to produce variations in turnover.... Centralization is an example of the determinant of turnover. Like the correlates, the determinants are included in statements which link them to turnover. An example is the statement that successively higher amounts of centralization are likely to produce successively higher amounts of turnover. Statements of this type are termed "propositions."... Propositions are explanatory statements, whereas empirical generalizations are descriptive statements. Or stated somewhat differently: propositions are theoretical statements, whereas empirical generalizations are factual statements." (p. 24)

In many studies of student attrition, variables such as sex or race have been entered as analytical determinants, when in fact they should be considered as correlates. These variables, however, are essential in identifying both a homogeneous population for study, and for the examination of interaction effects.

PATH ANALYSIS

Before proceeding with a discussion of the value of path analysis and the study of student attrition, it should be understood that student attrition will be defined as the cessation of individual student membership in an institution of higher education. Thus, the organizational perspective is used in this kind of research. The purpose of the research is to develop a methodology which will explain why students drop out of a particular institution and is not concerned with dropouts from higher education in general.

The purpose of this paper is not to describe in any detail the mathematics of multiple regression. See Kerlinger and Pedhazur (1973), Kim and Kohout (1975), Lewis-Beck (1974), and Duncan (1966), for useful discussions of the use and mathematics of path analysis of multiple regression.

Multiple regression is useful for two key reasons. First, it indicates the net effects of each variable in a regression equation. The net effects, that is, the comparative impact of an independent variable on a dependent variable with all other independent variables controlled, shows the relative importance of each independent variable in explaining variation in the dependent variable. The second reason for the selection of multiple regression is that it provides an assessment of the overall influence of the independent variables on the dependent variable. This is the R^2, or the amount of variance in the dependent variable explained by all the independent variables working together. An R^2, however, will increase with the addition of new independent variables to a regression equation unless the correlation between the independent and dependent variables is equal to zero. Since this is a rare occurrence, small but meaningless increases in the R^2 may add up to a considerable amount as new variables are added to the regression. Therefore, the adjusted R^2 ($\bar{R}^2$, adjusted for the degrees of freedom) should be used to indicate the total explanatory power of the theoretical model.

Multiple regression can also be used to test the direction and influence of the independent variables on the dependent variable. In this way the individual propositions used to develop a causal model can be tested. Multiple regression will also identify which variables in a regression equation are statistically significant using the F ratio.

Path analysis, described elsewhere (Heise, 1969; Kerlinger and Pedhazuer, 1973; Land, 1969), is an application of multiple regression analysis in conjunction with a causal theory. The causal linkages are proposed a priori from a causal

theory developed by the researcher. This causal theory specifies an ordering among the variables that reflects the presumed structure of the cause-effect linkages. Multiple regression shows the strength and direction of these linkages. As Kerlinger and Pedhazur (1973) write:

> "... Path analysis is not a method of discovering causes, but a method applied to a causal model formulated by the researcher on the basis of knowledge and theoretical considerations." (p. 305)

Therefore, it is useful in testing theory rather than generating theory. As Wright writes:

> "In cases in which the causal relationships are uncertain, the method can be used to find the logical consequences of any particular hypotheses in regard to them." (1921, p. 557)

Therefore, the first responsibility of a researcher intending to use path analysis in the study of student attrition is to develop a causal model which, to the best of the researcher's ability, should be recursive.

The second requirement for using path analysis in the study of student attrition is to have suitable measures of the variables expected to influence attrition. Because a reasonably large number of subjects should be used to study student attrition, in order to compensate for interaction effects, and thus maintain an N above 100 while looking at particular groups within the total sample of students, it is usually necessary to rely on questionnaires to gather this data. When using questionnaire data, the use of multi-item indicies is essential for establishing the validity and reliability of the instrument. Reliability of the multi-item indicies can be tested by the use of Cronbach's (1951) coefficient alpha. Furthermore, the total number of items in the questionnaire can be factor analyzed, which yields estimates of both concurrent and convergent validity (Bean, 1978). In this manner the consistency of the subjects' responses can be established.

Third, the researcher should test the assumptions necessary for multiple regression. Five assumptions should be met in order to use multiple regression. First, the relationship among the variables in the model should be linear. Linearity can be tested through SPSS subprogram Breakdown, where the F ratio for the significance of linearity can be compared with the F ratio for the significance of deviation from linearity. Non linear relationships are expected when the Eta^2 is considerably larger than the R^2. The second condition necessary for multiple regression is that the relation between the variables are additive, and not multiplicative. The test for interaction occurs by adding an interactive term to an existing regression, and finding out if this term significantly increases the R^2. For any increment in R^2 calculation, the multiple R^2 will be used. The test statistic is an F ratio in the format $F = \frac{(R^2_{II}-R^2_I)/b}{(1-R^2_{II})/n-a-b-1)}$ where R^2_{II} is the R^2 for the second model, and R^2_I is the R^2 for the first model, "a" is equal to the number of variables in model I, and "b" is equal to the number of variables added to model I to get model II and "n" is equal to the number of cases (Kerlinger and Pedhazur, 1973, p. 70). The equation for model I is $Y=b_1X_1+b_2X_2+a$, and model II is $Y=b_1X_1+b_2X_2+X_1X_2+a$, where X_1X_2 is multiplicative or "interactive" term. If an interaction effect exists, then the R^2 for the equation in model II should be larger than model I. A .02 increase in the R^2 can be considered significant, as suggested by Land (1969, p. 61). When multiplcative relationships are found, one may accommodate this by keeping the interaction term in the regression containing all the variables, or dividing the sample into two subsamples and analyzing these differently according to having a high or a low value on the variable which is producing the interaction.

The third assumption is that the variables in the regression equation are measured in an interval scale. Clearly, if a Likert-like scale is used, the variables used in the path analysis would be measured on the ordinal scale.

Several researchers, including Bohrnstedt and Carter (1971), Heise (1969), Kim (1975), and Land (1969) have demonstrated that multivariate parametric statistical techniques can be used with ordinal level measures. As Bohrnstedt and Carter (1971) conclude, "when one has a variable which is measured at least at the ordinal level, par .etric statistics not only can be, but should be applied." (p. 132)

The fourth assumption is that the error terms are independent. The independence of error terms can be checked by a visual examination of a plot of the residuals, which are conceived as a measure of the error component, which should indicate the extent to which error terms are intercorrelated. This visual examination, however, makes the interpretation of the degree to which the error terms are independent somewhat problemmatical. Regression analysis is fairly robust (that is, uneffected by the violation of this assumption) and thus, one is usually safe to assume that this condition exists in the data.

The fifth assumption is that the independent variables for any particular multiple regression equation, are not highly (i.e., above .70) (Kerlinger and Pedhazur, 1973, p. 94) correlated with each other, which is referred to as multicolinearity. The extent to which multicolinearity exists can be established by examining a correlation matrix for the independent variables to be used in the path model. Although Kerlinger and Pedhazur suggest that correlations above .70 cause problems with multicolinearity, the significance of a relationship between an independent variable and the dependent variable may disappear when several variables which are correlated at .35 or higher.

Two more assumptions are relevant for multiple regression analysis: that the error terms have constant variance -- homoscedasticity -- and that the error terms are normally distributed (Kim and Kohout, 1975). Fortunately, regression analysis is fairly robust against these assumptions, and thus the violation of either of these assumptions is permissible to some degree.

One final assumption relevant to path analysis is that the model is recursive. Recursiveness occurs where there is a one-way causal flow between the variables in the model (Kerlinger and Pedhazur, 1973). According to Land, (1969, p. 34) there are two primary sources of information which can be used to support the recursiveness of a set of variables. One source is the results of existing experimental of empirical case study research. The second source comes from the theoretical assumptions underlying the particular model under investigation. It will be the purpose of the remainder of this paper to describe a theoretical model suitable for testing by path analysis. It should be noted that path analysis, as an extension of multiple regression, is only useful in establishing the causes of student attrition to the extent that that causal model accurately describes the longitudinal process involved in a student's decision to leave an IHE.

A CAUSAL MODEL OF STUDENT ATTRITION

The model to be developed in this paper has six main elements. These are the dependent variable - dropout, the intervening variables (sometimes called endogenous variables), the organizational determinants, the background variables, personal determinants, and environmental determinants. In addition, it is important to discuss a set of control variables used both to select a homogenious subpopulation and to test for an interaction effect in the data set. The model developed here is a synthesis of the determinants used in research on work organziations and of research on student attrition. The model will represent the explicit propositions, as well as several "implicit" propositions, which are not directly specified in the model.

The determinants of student attrition appear in Figure 1, which is a causal model of student attrition. The definitions of the variables which appear in this model are given in Table 1. A proposition is an explanatory or theoretical statement (Merton, 1968, p. 149-153; Parsons, 1949, p. 6-16, 27-42; Zetterberg, 1965,

p. 79-86). The independent variable in this proposition is referred to as the determinant. Each proposition takes the form "successively higher (lower) amounts of X (the determinant) will likely produce successively higher (lower) amounts of student attrition." This form of the proposition indicates the direction of the causality, and the proposition is stochastic (i.e., probable) (Zetterberg, 1965, p. 70). It is a "customary assumption" that each of the propositions is qualified by the phrase "other things being equal" (Price, 1977, p. 67). In the discussion below, examples of the propositions will be given and each set of variables will be discussed.

The Dependent Variable

The dependent variable in this causal model is dropout (DROPOUT), which has been defined as the cessation of individual student membership in an institution of higher education. This variable should be measured by registration data, and may be a dichotomous variable where those who stay in the IHE are compared to those who leave. This methodology requires that the questionnaire be filled out by subjects during a single time period and that the characteristics of people who decide to stay in the institution are compared with the characteristics of those who leave the organization at a later date. Dropout can be made a "continuous" variable by giving those students who leave an institution soon after taking the questionnaire a higher score, and by giving students who leave the institution after a longer period of time a lower score. For instance, a student who leaves during the semester the questionnaire is given might be scored 5, those who leave in the next semester scored 4 and the following semester 3, etc., with stayers scored 0.

The Intervening Variables

There are eight intervening variables in the causal model. Seven of these variables are expected to influence the eighth, institutional commitment (INCOMIT).

Institutional commitment is seen as the most important variable influencing dropout decisions (Tinto, 1975; Spady, 1971; Bean, 1979). Institutional commitment, defined as the degree of loyalty towards membership in an organization, is measured by a student's intention to stay in or leave an IHE. The remaining seven intervening variables, institutional quality (INSQUAL), practical value (PRACVAL), development (DEVP), satisfaction (SAT), boredom (BOR), absenteeism (ABSENT), and adjustment (ADJUST), are all expected to influence dropout by increasing or decreasing a student's commitment to the institution. The propositions associated with these intervening variables would read as follows: Successively higher levels of, e.g., institutional quality, will likely produce higher levels of institutional commitment. Successively higher levels of institutional commitment will likely produce successively lower levels of dropout. All propositions indicated by an arrow between two variables can be read in this fashion. Institutional quality, practical value, development, satisfaction, and adjustment are all likely to increase institutional commitment; boredom and absenteeism are likely to decrease institutional commitment.

Several empirical studies support the proposition that institutional quality (INSQUAL) has a positive influence on persistence in college (Astin, 1971; Kamens, 1971; Wegner, 1967; Wegner and Sewell, 1970; Bean, 1979).

Practical value (PRACVAL) is also seen as increasing institutional commitment. The more intensely one believes that the education one is currently receiving will lead to employment after college, the less likely one is to leave. Five codifications (comprehensive reviews of the literature) were found which lend support to this proposition (Pantages and Creedon, 1978; Tinto, 1975; Spady, 1970; Summerskill, 1962; Bean, 1978), but their support was equivocal. Spady reported one study (Iffert, 1958) which found that retention was highest among students in occupationally oriented fields, and suggested that the cause of this was that their vocationalism

was reinforced and supported in the practical academic context. Summerskill (1962) found a generally positive relationship between high vocational goals and persistence, but the reverse could occur in a highly intellectual climate. Five empirical studies also support this proposition (Iffert, 1958; Reed, 1968; Kamens, 1968; Terenzini and Pascarella, 1976; Bean, 1979).

That higher levels of self development (DEVP) through education will likely produce higher levels of institutional commitment, and therefore lower levels of student attrition, is also supported in the literature (Bean, 1979; Tinto, 1975; Medsker and Trent, 1968; Sarnoff and Raphael, 1955). Institutional quality, practical value, and self development, can all be considered as surrogate measures for pay. That is, the higher quality of the institution, the more valuable a degree from that institution will be in attaining future employment; and the more skills a student develops, the more valuable this student will be as an employee, and thus the more potential for higher levels of pay. Finally, belief that a student's education will lead to employment (practical value) is a direct measure of the expectation for a future income based on one's current education. As described elsewhere (Lawler, 1971; Price, 1977), pay has been found to be one of the most important determinants of turnover in work organizations. Therefore, these surrogate measures for pay may indeed be expected to influence institutional commitment and thus dropout.

Satisfaction (SAT) with the social system is the degree to which the members of the social system have a positive affective orientation towards membership in this system (Smith, et al., 1969). As implied by the causal model, satisfaction can be viewed as the result of the organizational variables. The relationship between satisfaction and institutional commitment has been supported by seven empirical studies (Bard, 1969; Bean, 1979; Starr, Betz and Menne, 1972; Hoffman, 1971; Howitt, 1972; Panos and Astin, 1968; Robinson, 1969). Panos and Astin's national

survey reported that for males, the most frequent reason given for dropping out was dissatisfaction with the college environment. This was the second most important reason given by females. Bean (1979) found that satisfaction was significantly related to institutional commitment for females, and significantly related to dropout for males. Boredom (BOR) was included as an intervening variable and is expected to behave in the way opposite of student satisfaction. The support for boredom increasing rates of dropout is given by three codifications (Pervin, et al., 1966; Astin, 1975; Terenzini and Pascarella, 1978).

The placement of absenteeism (ABSENT) as an intervening variable is somewhat uncertain. Although absenteeism has been linked to turnover in work organizations (Price, 1977), few studies link absenteeism to dropout. Therefore the placement of this variable is tentative. For example, absenteeism could be considered as an organizational determinant or an intervening variable like institutional commitment which is influenced by the six other intervening variables.

Adjustment (ADJUST) is another variable which has not received widespread study. Adjustment here is not considered so much a psychological variable as a socio-cultural variable in a way suggested by Astin (1975). That is, students from small high schools and small home towns, who travel from great distances or from other states are expected to be less well adjusted than students from larger high schools, larger home towns, a shorter distance home and who are state residents. Anthropologists describe this form of maladjustment as culture shock. This intervening variable, therefore, is expected to be influenced by background variables more so than organizational variables.

The location of satisfaction as an intervening variable has been supported by previous studies in work organizations (Price, 1977) as well as studies of student attrition (Spady, 1971; Tinto, 1975; Bean, 1979). There is less support for the location of the rest of the intervening variables. The location of these variables,

however, is consistent with the theoretical psychological sequence which results in emotions described by Locke (1976). The causal sequence is as follows: object (situation) --> perception (cognition) --> appraisal (value judgment) --> emotion (p. 1330). In the case of the causal model student attrition, the organizational determinants are seen as objects or situations in which the student finds him or herself. This "reality" is first perceived, and then appraised. In this way, the intervening variables emerge as the appraisal of the objective situation which is measured by the organizational determinants. Institutional quality is an appraisal of the quality of the institution based on one's experiences with the institution. The same goes for practical value, development, and adjustment. Satisfaction and boredom are treated as intervening variables simultaneously with these value adjustments, although satisfaction might better be described in Locke's model as an emotion. Therefore, satisfaction and boredom might appear in the causal model between the other intervening variables and institutional commitment. Testing this model should produce information useful in determining how these intervening variables operate. Again, the location of absenteeism is problemmatical. It is possible that absenteeism should appear after satisfaction or boredom in the causal sequence. That is, absenteeism may be a behavioral response to an emotion. Testing the model should determine the extent to which absenteeism influences institutional commitment, and hence dropout.

The Organizational Determinants

Five of the organizational determinants have been derived from studies of turnover in work organizations. These are routinization, instrumental communication, integration, centralization, and distributive justice. In addition to these, the three pay variables described as intervening variables, and a fourth pay variable, university grades, can also be considered to be supported by organizational studies. Literature from organizational studies in support of these variables has been

described elsewhere (Price, 1977; Bean, 1978). These variables also find some support among studies of student attrition.

Routinization (ROUT) as such is not treated in the educational literature. Two codifications (Pervin, et al., 1966; Astin, 1975) cite boredom, an assumed psychological response to routinization, as having a positive influence on student attrition. More indirect evidence is offered by Iffert (1958) who found that "lack of interest in studies" was the chief reason given for dropping out among men, and the fourth most important among women. Routinization could be one of the factors increasing this boredom or lack of interest.

Instrumental communication (INSCOM) is defined as the degree to which information about being a student is viewed as being received. Three empirical studies have dealt with variables similar to instrumental communication with mixed results. In a review, Sheffield and Meskill (1974) found that "adequate freshmen orientation was considered by researchers as 'most significant opportunity for an institution to curb it's rate of student attrition' " (1974, p. 40). Steel (1974) found that the availability of information concerning the existence of university services was not significantly related to student attrition. Thus, it is the supporting literature from other types of organizations which suggest that communication will affect student attrition. In my own research (Bean, 1979), communication about the rules of the institution was ranked tenth in total causal effects on dropout for females, and sixth for total causal effects for males. However, in the case of females, the influence of knowledge about rules on dropout decisions was positive, as opposed to negative, the expected direction. This variable will require further study.

Integration (INTEGRA), defined as the degree to which a student participates in primary or quasi-primary relationships (i.e., having close friends), is well supported in the research on student attrition. Three codifications (Sexton, 1975;

Spady, 1970; Tinto, 1975) strongly support the proposition that higher amounts of integration will likely produce lower amounts of student attrition. In fact, in the theoretical models developed by Tinto and Spady, it is argued that integration is the single most important factor in determining attrition among college students. Two empirical studies reported that social integration via friendship support is directly related to persistence in college (Flacks, 1963; Jones, 1962). Seven empirical studies supported this proposition with the finding that individual perceptions of social integration are directly associated with persistence (Panos and Astin, 1967; Pervin et al., 1966; Rootman, 1972; Scott, 1971; Spady, 1971; Steele, 1974; Terenzini and Pascarella, 1976). Two studies report contrary findings. Medsker and Trent (1968) found that students who have a greater number of friends leave school because they do not devote enough time to their studies. Spady (1970) discusses such friendships as being "profane" as opposed to "profound". Integration here is similar to Spady's concept of "profound" friendships. In my own research (Bean, 1979), integration was significantly related neither to satisfaction, institutional commitment, nor dropout. This finding may in part be due to difficulties with the measures of integration.

Although the role of centralization (CENT) in having a positive influence on turnover in work organizations is well documented, little if any research has been done on the effect of centralization upon students, but several findings are relevant. Rose (1965) in an empirical study found that "defaulters" (voluntary dropouts) vary greatly from persisters in acceptance of authority. Since acceptance of authority would logically be opposite of the desire to participate in decision making, Rose's findings tend to support the proposition. Rose's focus, however, was more on personality variables.

Panos and Astin (1968), in a study of more than 100,000 college students, report mixed findings. On the one hand, the severity of administrative policies

against student aggression is positively related to dropping out of school, while the severity of administrative policies against drinking or cheating is negatively related to dropping out of school. Since such policies limit "participation in decision making," they can be viewed as giving mixed support to this proposition. These researchers also reported a second related finding, viz., administratively determined environmental pressures characterized by the provision of little or no structure had a positive influence on student attrition. The students apparently felt that lack of structure related a lack of concern about students on the part of the administration. This finding would tend to negate the proposition. In my own research (Bean, 1979), centralization was not significantly related to satisfaction, institutional commitment, or dropout.

Distributive justice (DISTJUST) does not receive much attention from educational researchers. Tinto (1975) noted that institutions distribute rewards more according to academic achievement than social attainment, but did not mention the issue of fairness of the distribution of these rewards. Davis (1966) found that students compared themselves with other students -- comparison is the basis of distributive justice — but made no reference to the fact that such comparisons may influence feelings of equity. Panos and Astin (1968) found that students are more likely to complete four years of college if there are strong rules against cheating at the institution. Iffert (1965) found in a follow-up study that a significantly higher proportion of active students than dropouts subscribe to the statement, "I felt (feel) I was treated fairly (by the college)." Follow-up studies, however, probably lack validity (Pantages and Creedon, 1978). Bean (1979) reported a deviant finding in which distributive justice had a negative influence on institutional commitment.

University grade point average (UGRADES) can also be considered as a surrogate measure for pay. Tinto (1975) described grades as "an 'extrinsic reward' which, as tangible resources, could be utilized for future educational and career mobility"

(p. 194). As such, they are perhaps the closest surrogate to pay in work organizations. Spady (1970) ellaborates:

> "... Grades represent the most conspicious form of reward. They are basically extrinsic and are used as tangible resources in the quasi-occupational role-playing of the career-oriented student in his negotiations for improved opportunity for success (p. 77)."

Support for this proposition is wide spread (Astin, 1975; Bean, 1979; Berg, 1970; Blanchfield, 1971; Cooper, 1974; Cope and Hanna, 1975; Dutt, 1971; Eckland, 1964; Iowa, 1959; Johansson and Rossman, 1973; Pedrini and Pedrini, 1974; Spady, 1970; Tinto, 1975). Astin (1975) reported that "the student's GPA is strongly related to persistence, more so than any other student variable in this study." Tinto (1975), in his codification, reported that grades were the single best predictors of persistence at an IHE. Studies have shown grade performance to be the single most important factor in predicting persistence in college (Ammons, 1971; Astin, 1972; Blanchfield, 1971; Coker, 1968; Greive, 1970; Jaffe and Adams, 1970; Kamens, 1971: Moch and Yonge, 1969). Several studies report negative findings that students who voluntarily withdraw often have higher grades than those students who stay (Coker, 1968; Hackman and Dysinger, 1970; Hanson and Taylor, 1970; Merha, 1973; Sexton, 1975; Vaughn, 1968). In part, this may be due to transferring. Other things being equal, the higher one's grades, the greater the opportunity to transfer. Thus support for this proposition is less than unanimous.

There are nine other organizational determinants which are expected to influence dropout decisions working through the intervening variables. These are: advisor, faculty relationship, housing, campus job, campus organizations, univerity services, courses, competitive academic program, and demanding academic program. These variables tend to be specific to IHEs rather than work organizations.

Three codifications (Astin, 1975; Sexton, 1975; Tinto, 1975) support the proposition that increased helpfulness of an advisor (ADVISOR) will likely produce

a decrease in student attrition. Six empirical studies were found which also support this proposition (Hill Advisory Unit, 1974; Johansson and Rossman, 1973; Morehead and Johnson, 1964; Robinson, 1969; Rossman, 1967; Steele, 1974). Bean (1978) cites three codifications and seven empirical studies which support this proposition. Informal contacts with faculty members (FACREL) has also been considered an important determinant. Terenzini and Pascarella (1978) found that the second most important variable for distinguishing between persisters and leavers is the amount of student's informal contact with faculty members.

Housing arrangements (HOUSING) are also important in influencing student attrition. Astin (1975) found that living with one's parents was positively related to student attrition for men, but not for women. He also reported that living in a dormitory during a student's first year had a slight negative effect on attrition, as did living in a fraternity or sorority in later years. Having a campus job (CAMPJOB) has also been studied in relation to student attrition. Astin (1975) in his national study found that "an on-campus job, even during the freshmen year, substantially increases the chances of finishing college (p. 156)." Sexton (1975) concluded that evidence from the literature does not mitigate against students having jobs, but that in fact it might show higher motivation. Kohen, et al., (1976) found that working more than 20 hours a week had a significant negative influence on staying in school. The issue of work is further complicated by the fact that some students work on campus and some off campus; some students do busy work and others do research directly related to their major interests; and some students work only a few hours per week while others work at full time jobs. Having a campus job may be symbolic of what Spady has called "structural integration" into the institution. The measure of campus jobs must take this complexity into account.

Being a member of a campus organization (CAMPORGS) is expected to reduce dropout and increase institutional commitment. Four codifications (Pantages and Creedon,

1978; Sexton, 1966; Spady, 1970; Tinto, 1975) support this proposition, citing 18 different empirical studies which also lend support. Sexton (1975, p. 307) suggests that the lack of participation in "extracurricular activities" may be regarded as evidence of less complete integration into college life, which results in a higher incidence of student attrition. Five additional empirical studies support this proposition (Bean, 1979; Brooks, 1971; Eckland, 1964; Office of Education, 1967; Vaughan, 1968a).

The determinant university services (USERV) is not well supported by past research. Greater use of university services, however, could be expected to increase student's structural integration into the college community, and it is through this type of integration, suggested by Spady (1971), and Tinto (1975) that student attrition should be reduced. However, it is usually of interest to university officials to find if use of such services as the library, counseling, programs to improve study skills or make up for other academic deficiencies, are of any use in keeping students enrolled at an institution.

The availability of courses (COURSES) the student wants to take may also tend to pull a student towards or push a student out of a particular IHE. If the courses offered at the institution are exactly what the student wishes to take, the student is more likely to stay, while if the student would like to study in an area where no courses are offered. the student might seek to transfer. This determinant seems worthy of inclusion in further research.

The inclusion of academic program being demanding (APDEM) and competitive (APCOMP) in the model is based on the work of Terenzini and Pascarella (1978), where these variables were found to significnatly contribute to the explanation of dropout. As one can see from Figure 1, the effect of these two determinants on the intervening variables is less than certain. These determinants are further complicated by the fact that they would likely interact with personality characteristics. A student with a "competitive" personality, who described the academic

program at the institution as being competitive would be likely to stay, whereas the student who does not enjoy competition and who finds the academic program competitive would be likely to leave. The same holds true for the academic program being demanding. Therefore, the inclusion of these variables as determinants is tentative.

Background Variables

Background variables fall into two types; those associated with the student and his family, and those associated with the student's high school environment. The variables associated with the performance of the student in high school (high school GPA and standardized test scores) (PERFORM) and the student's parent's education (MOMED, POPED), are primarily expected to influence the organizational determinants and the personal determinants. The remaining background variables, high school size (HSSIZE), home town size (HOMETOWN), distance to a student's home (HOMEDIST), and being a resident of the state where the IHE is located (STATRES), are primarily expected to affect the student's adjustment to the institution, but may be expected to influence certain of the organizational determinants as well. The assumed direction of causation is given in Figure 1. Since only performance is probably a determinant, this class of variables is referred to as background variables as opposed to background determinants.

Performance (PERFORM) is a measure of a student's past academic performance in both high school and on standardized aptitude tests. Although probably correlated with ability (i.e., intelligence as measured by standardized IQ tests), this related concept is not to be confused with performance. Six codifications support this proposition (Tinto, 1975; Spady, 1970; Pantages and Creedon, 1978; Pedrini and Pedrini, 1974; Sexton, 1966; Summerskill, 1962; and Bean, 1979). Tinto (1975) reported that ability was twice as important a predictor of attrition as was socio-economic status, and that grade performance was a better predictor of attrition than standardized test scores.

Pedrini and Pedrini (1974) reviewed 35 empirical studies and concluded that:

> "The majority of data has suggested that students who persist, transfer, dropout, or flunk out can be discriminated on the basis of high school grades ... and standardized test scores. (p. 25)."

In my own study (Bean, 1979) of 900 freshmen in a major midwestern university performance was found to be the second most important determinant of dropout in total effects for females, and significantly related to institutional commitment for males. What is most important is that for females, performance is significantly related to institutional commitment, satisfaction, development, university grade point average, memberships in campus organizations, practical value of the education and institutional quality. The importance of this variable can hardly be over-emphasized.

With regard to mother's and father's education (MOMED, POPED), Spady (1969) reports that:

> "Although we were unable to control for intelligence, our findings are not inconsistent with their (Medsker and Trent, 1968) interpretations: during the past thirty years variations in father's education account for 45 percent of the differences in the likelihood of high school graduates actually reaching college, but only 20 percent of the differences in their chances of their finishing." (p. 69)

In this context, parent's education would likely affect the student's motivation and grade point average. In the causal model provided in Figure 1, it is also assumed that parent's education will influence several personal variables, with higher levels of parental education likely increasing the student's levels of goal commitment, major certainty, occupational certainty and confidence in being a student.

The remaining background variables, high school size, home town size, distance home, and being a state resident, presumably affect institutional commitment through adjustment to the institution. High school size (HSSIZE) may be expected to be positively related to both integration and high school grades. This variable is expected to be positively related to integration because the chances of having a

friend from a large high school attend the same college is greater when the size of the high school class is larger. Secondly, a student from a small high school may have difficulty adjusting to the large and impersonal lecture courses at a university, whereas a student from a large high school may not.

Coming from a home town (HOMETOWN) similar in size to the town where the IHE is located could also be expected to reduce problems of adjustment to the institution (Spady, 1970). State residents (STATRES) should have fewer problems of adjusting to other students at the IHE, as well as often paying lower tuition rates, which might be expected to reduce student attrition for financial reasons. A shorter distance home (HOMEDIST) would also be expected to ease the adjustment of a student to an institution, reducing homesickness and allowing a student to break dependency on his/her parents more gradually (Mehra, 1973).

Personal Variables

It should be noted at the outset that these are personal variables and not personality variables. These are goal commitment, or the importance of getting a bachelor's degree to the student and/or the student's parents; major certainty; occupational certainty; and finally, confidence in being a successful student. Although confidence may be closest to a psychological variable, it is specifically the confidence one has in being a successful student at a particular institution which would be expected to influence institutional commitment.

One fundamental goal of attending a college is the receipt of a bachelor's degree. The more commitment (GOALCOM) a student has to accomplishing this goal, the less likely a student would be to leave the college, except in the case of transfers. Tinto (1975) writes that the commitment to get a bachelor's degree is a "complex, multidimensional process of interaction between self, family, and past educational experience" (p. 103). In view of this complexity, the goal of completing college is assumed to be shared jointly by a student and by the student's parents.

Three codifications support this proposition from the point of view of the student (Cope and Hanna, 1975; Spady, 1971, Tinto, 1975). Tinto (1975) found ten empirical studies supporting this proposition which lead him to conclude "once ability is taken into account, commitment to the goal of completing college is the most influential in determining college persistence" (p. 102). Two other studies also support this proposition from the student's perspective (Sewell and Shah, 1967; Hoffman, 1971), and one from the parent's perspective (Sexton, 1965).

Certainty of major (MAJCERT) is defined as the degree of certainty that a student has that s/he will graduate with a major in a specific academic discipline. Certainty of major should not be confused with the field of intended major. Research into attrition based on a student's major field usually does not produce significant differences between persisters and leavers (Astin, 1964; Astin, 1975; Baldwin, 1975; Berg, 1970). Bean (1979), found that for males, major area (uncertain scored 0, arts and sciences scored 1, and preprofessionals scored 2) was significantly related to institutional commitment. In that study, however, major certainty failed to be significantly related to either institutional commitment or to dropout.

Indirect support for the proposition that successively higher levels of certainty about one's major field of study will likely produce successively lower amounts of student attrition comes primarily from studies which related occupational certainty (OCUCERT) to persistence. The assumption is made that occupational certainty logically necessitates certainty of major, or at least should increase the certainty of one's major by eliminating fields of study irrelevant to one's vocational choice. Three codifications (Pantages and Creedon, 1978; Spady, 1970; Summerskill, 1962) provide direct support for the influence of occupational certainty of reducing attrition, and therefore indirect support for major certainty in reducing attrition. Six empirical studies also support these propositions (Abel, 1966; Iffert, 1958: Iowa, 1959; McCammon, 1966; Rose and Elton, 1971; Slocum, 1956).

Confidence in one's ability to be a successful student (CONF) at an institution is supported by a single study of medical students (Hutchinson and Johnson, 1966).

The four personal variables are not expected to influence the first set of intervening variables, but are expected to influence institutional commitment and dropout directly. For example, there is no reason that increased goal commitment would increase one's belief that the institution was of high or low quality. It is perhaps more meaningful to consider the influence of low scores in the determinants related to these personal variables. For example, a lack of goal commitment would probably decrease institutional commitment and increase the likelihood that a student would leave school. The same goes for major certainty and occupational certainty. Heywood (1971), in his codificiation of student attrition literature in Great Britian, reported that students with definite short and long range goals were more likely to remain in British IHEs than are students who are uncertain. Lack of confidence in being a good student at an institution would likely reduce one's institutional commitment to that institution and increase one's chances of dropping out.

Environmental Variables

Six environmental variables are thought to influence both institutional commitment and dropout decisions. Again, these environmental variables are not expected to influence the intervening variables other than institutional commitment.

Opportunity is defined as the availability of alternative roles in the environment (Hickson, Henings, Lee, Schneck, and Pennings, 1971). For students, these alternative roles would most commonly be transferring to another IHE (OPPORTTR) or of getting a job (OPPORTJB). High opportunity occurs when transfer is easy, and jobs are plentiful. A basic assumption behind opportunity is that members have information about these opportunities. A second assumption, that members have the (legal) freedom to leave, is not applicable to student attrition

in this study, since it applies universally to students in IHEs in the United States.

The influence of opportunity on employee turnover is well documented in the literature. Price (1977) reports six codifications, two reviews, and five empirical studies which corroborate the idea that opportunity influences turnover. Price (1977) locates opportunity in a position where it is expected to interact with satisfaction, but did not find evidence for this interaction in later research (Price and Bluedorn, 1977). In general, satisfied members will stay in an organization regardless of opportunity, while dissatisfied members will actually leave an organizational only when there is a perceived opportunity to do so. A corollary of this idea is "lack of opportunity" which might be caused by difficulties in financing a college education. In this sense, students who are dissatisfied with the institution will leave regardless of their financial ability to stay, whereas students who are satisfied with the institution will stay only if they have the money to finance their education. Such an interaction effect has in fact been found in a continuing analysis of the data used in a study of student attrition at a major midwestern university (Bean, 1979), but has not yet been reported.

The opportunity variables may also be considered as organizational determinants, based on the theory of relative deprivation (Merton and Kitt, 1950, pp. 42-53). That is, when people perceive a better opportunity elsewhere, they feel relatively deprived in their own circumstances, which would decrease their institutional commitment and increase the likelihood that they would drop out of the IHE.

The important influence of a student's family on the student has been found in an empirical study by Hammond (1971), and discussed at some length by Pantages and Creedon (1978). In essence, the argument is that college freshmen are still, to a greater or lesser extent, dependent upon their parents, and if their parents disapprove of their going to college, the likelihood of their remaining in college

is reduced. Besides family approval (FAMAPR), kinship responsibility (FAMRESP) (obligations to other members of one's family) has been found to influence turnover in work organizations (Price, 1978), and this is thought to be especially true among part time students. It may also be thought to be more prevalent among women than among men, assuming that the traditional role of women being primarily responsible for raising children holds true.

The support of marriage as a determinant is somewhat mixed. Pedrini and Pedrini (1974) report that marriage does not seem to have significant impact on achievement, but is strongly related to student attrition. Hoffman (1971) found that withdrawers at a private four year liberal arts college marry sooner than persisters. Marital status, however, as reported by Kohen et al. (1966) was not found to be a significant predictor of attrition. Therefore, it is the likelihood of getting married (MARRY) rather than actually being married which is likely to reduce institutional commitment and increase dropout. This probably occurs because marriage brings with it family responsibilities, or a student's fiance (or spouse) finishes school and leaves which results in the student's leaving as well.

Financing a student's education ('ONEY) has been difficult to study. Astin (1975) stated that since the purposes of financial aid often are not explicit (i.e., for merit, athletic ability, or need) the variable is difficult to assess. Renas (1971) found that a student staying in school was frequently affected by the student's success in obtaining financial assistance. Among the significant conclusions for Russ (1973) was that the amount of financial aid received was the variable most closely related to persistence. Astin (1975) found that scholarships had a very slight effect in reducing attrition, where loans had a persistent negative effect on persistence. Beyer (1971) found that students who had financial aid dropped out of school more often than students who did not have financial aid.

In addition to financial aid, family income can be considered as one of the sources of funding available to some degree in supporting students while attending an IHE. Astin (1975) gives good reason why the variable by itself is not necessarily a good predictor of student attrition: "when family income is included in the regression analysis with other measures of family background and student ability ... it fails to add anything over and above the contribution of these other variables" (p. 35). Other things being equal, the more difficult it is to finance one's education, the more likely the student is to drop out. Therefore, successively higher amounts of ease in financing one's education is likely to produce successively higher amounts of institutional commitment, and successively lower amounts of dropout.

These six environmental variables are thought to influence dropout in the way specified in Figure 1. They are different from the organizational determinants in the sense that they are not expected to act through the intervening variables except in influencing institutional commitment.

DISCUSSION OF THE CAUSAL MODEL

In path analysis, and for that matter multiple regression, the entry of the variables into the regression equations is extremely important. This is because where multicolinearity exists between independent variables, the size of their path coefficients is reduced. If one variable is introduced before a second, i.e., in a step-wise entry of variables, variables which are potentially significantly related to the dependent variable do not reach a level of significance.

For testing the causal model described in this paper, the following regression should be used. Dropout should be regressed first on the background variables, second on the organizational determinants, third on the numbered intervening variables, fourth on institutional commitment, fifth on the personal variables, and sixth on the

environmental variables. The variables should be entered into one regression equation in sets in that order. The reason for this is to find if the endogenous variables work as intervening variables, subsuming the variance of the previously entered set of variables on the dependent variable. For example, when dropout is regressed on the background variables, performance may be significantly related to dropout. However, when dropout is regressed on the organizational variables with the background variables already in the equation, the significance of the relationship of performance to dropout may disappear, and university grades may then be significantly related to dropout. One can then look at the direct effects of performance on dropout as well as the indirect effects of performance on dropout through university grades. By adding to the direct effect of performance on dropout and the indirect effect of performance through university grades on dropout, one can establish total causal effects. The importance of examining total causal effects has been stressed elsewhere (Lewis-Beck, 1974). Total causal effects can be used to rank the importance of all the variables in the equation for determining dropout.

The personal variables and the environmental variables are entered into the equation last because their effects on the endogenous variables is uncertain, and to a large extent they are outside of the control of the organization. It is assumed that most of the variance in dropout (and in institutional commitment) will be as a result of the organizational determinants and the intervening variables, but it is important to test for the significance of these other variables in influencing institutional commitment and dropout in order to better understand the process of attrition.

Great emphasis has been placed on the importance of recursiveness in a path analytic model. All the temporal relationships posed in the causal model of student attrition may not be undebatable. There is little difficulty in seeing that background variables precede the organizational variables, and that the organizational

variables and intervening variables precede dropout. The problemmatical area for this path model rests in the placement of the intervening variables. It is possible to treat all organizational determinants and intervening variables as organizational determinants. Although this would reduce the debate about the temporal relationship of the variables, it would also significantly reduce the understanding of the longitudinal process of student attrition. It was argued earlier that the organizational determinants represent more or less objective conditions and that the intervening variables represent the value response or emotional response of the objective assessment of the individual's interaction with the organization. The location of absenteeism in the model remains problemmatical.

The Control Variables

Eleven additional measures should be made in studying student attrition. These are: class rank (e.g., freshmen) (CLASS), sex of the student (SEX), age (AGE), marital status (MARITAL), whether the student is full or part time (FULLPART), whether the student has transferred (TRANSFER), what college or major area the student is involved with (MAJOR), whether the student is foreign (FOREIGN), the number of semesters the student has attended the institution (SEMNUMB), the race and/or ethnicity of the student (RACE), and the parent's income (PARINCOM). There are two reasons for including these variables in the study of student attrition. The first is to select from the total number of respondents a homogeneous population for study. One of the probable reasons that the R^2 produced by most multivariate studies has been around .10 is that heterogeneous populations were studies. At the same time, variables such as race may be correlates rather than determinants of student attrition. In addition to using these variables to select a homogeneous population for study, if the sample size is large enough, these are the variables which should be included in tests for interaction effects.

Variables found to interact can be treated in two ways: either the interaction term can be included in the regression (entered last in the total regression), or the population can be divided and separate path models can be made for various subsets of the population. Ideally, interaction should be tested between all variables in a regression equation, and second and third order interactions can be tested as well. Interaction effects thus can become a bed of worms which quickly overload the capacity of most computers. They are, none the less, important to consider when making studies of student attrition, and are one of the probable reasons that the R^2 for previous multivariate studies have not been very high. The interaction based on sex should not be ignored. It is both easy to understand, easy to treat in a particular manner, and previous regression models for males and females have been quite distinct (Spady, 1971; Bean, 1979).

Remarks

There are two problems associated with the causal model for student attrition in this paper. First, there are more variables in this model than one would like, i.e., the model lacks parsimony. Second, this model in general avoids personality characteristics which may influence dropout directly or possibly produce interaction effects. The regression of a dependent variable on a set of independent variables rarely produces more than ten variables significantly related to the dependent variable. A model of student attrition which had two or three intervening variables, a dozen organizational determinants, and two or three background variables producing an R^2 above .5 would be highly desirable. However, since personal variables, and environmental variables are also likely to influence dropout decisions, these types of variables too must be considered. By creating a path model, the number of variables any dependent variable must be regressed upon can be reduced. This situation also arises from theory trimming (Kerlinger and Pedhazuer, 1973) in

which nonsignificant variables can be omitted from the regression equation without substantially reducing the adjusted R^2.

Finally, there is the problem that dropout is a dichotomous variable composed of stayers and leavers. They may produce some problems for significance tests when the proportions in each of the categories are extreme, that is, when one category has more than 75 percent of the cases (Knoke, 1975). Since the instrument used to measure student attrition requires that the student be enrolled in the institution for a reasonable amount of time (most of a semester or most of a year), the rate of attrition before the next registration period may be only ten to fifteen percent. This problem can be avoided by turning dropout into a "continuous" variable, as discussed earlier. Also, stopouts and transfers should be treated separately from dropouts, and voluntary leavers treated separately from involuntary leavers.

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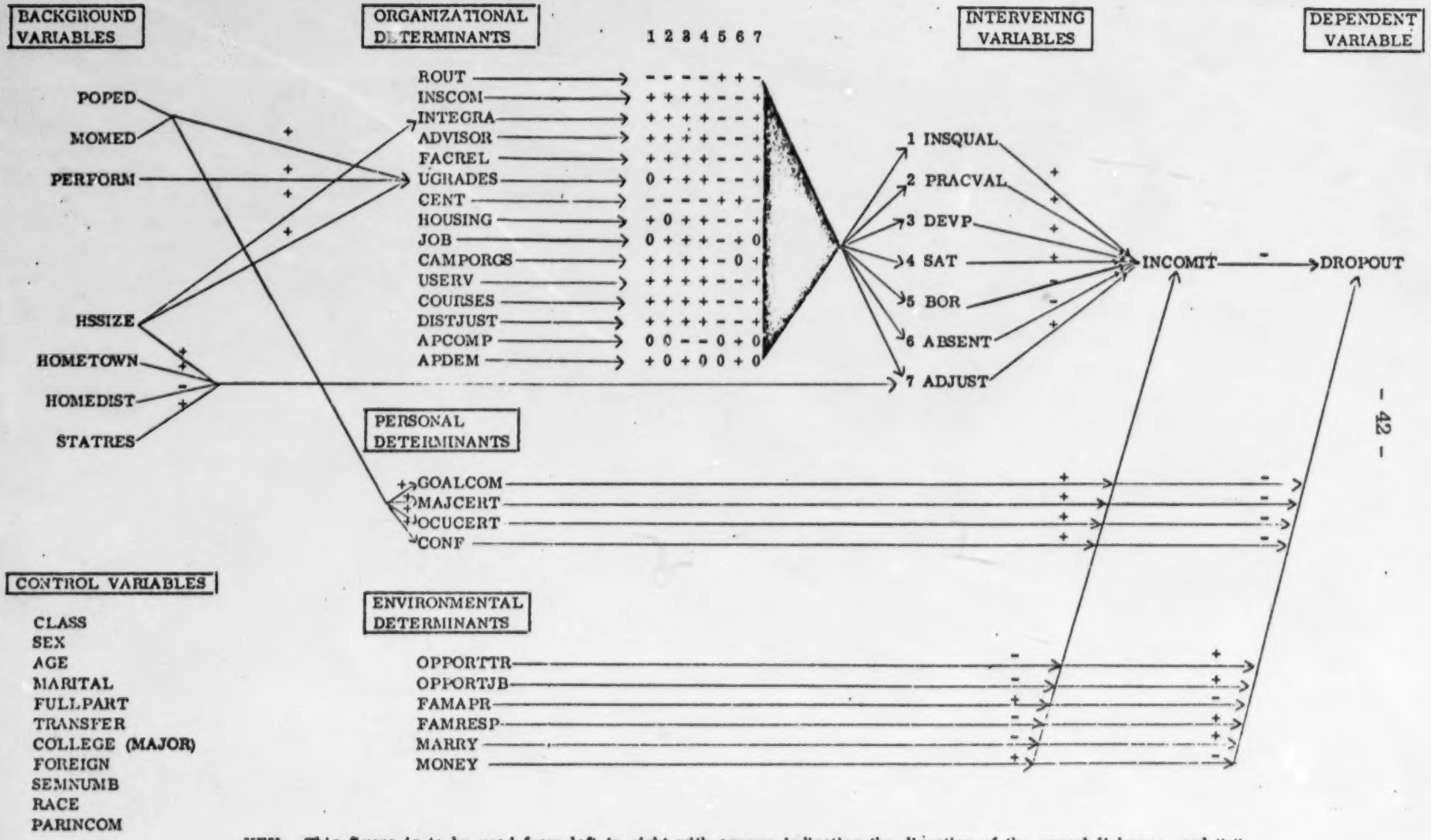
FIGURE 1

A CAUSAL MODEL OF STUDENT ATTRITION



KEY: This figure is to be read from left to right with arrows indicating the direction of the causal linkages, and "+" indicating a positive relationship and "-" indicating a negative relationship. The columns of "+" and "-" signs, numbered from 1 to 7, indicate the expected relationship between the organizational determinants and the intervening variables, whose numbers 1 to 7 correspond to the seven columns. A "0" indicates an uncertain relationship.

TABLE 1

Definition of Variables

Variable Label	Variable Name	Definition
DEPENDENT VARIABLE		
DROPOUT	Dropout	The cessation of individual student membership in an IHE.
INTERVENING VARIABLES		
INCOMIT	Institutional Commitment	The degree of loyalty toward membership in an IHE.
INSQUAL	Institutional Quality	The degree to which the IHE is perceived as providing a good education.
PRACVAL	Practical Value	The degree to which the student perceives that his/her education will lead to employment.
DEVP	Development	The degree to which a student believes that he/she is developing as a result of attending the IHE.
SAT	Satisfaction	The degree to which being a student is viewed positively.
BOR	Boredom	The degree to which a student finds university life tedious.
ABSENT	Absenteeism	The extent to which a student voluntarily misses classes.
ADJUST	Adjustment	The degree to which a student feels well adjusted to college life.
ORGANIZATIONAL DETERMINANTS		
ROUT	Routinization	The degree to which the role of being a student is viewed as repetitive.
INSCOM	Instrumental Communication	The degree to which information about being a student is viewed as being received.

Table 1
Definition of Variables (Continued)

Variable Label	Variable Name	Definition
INTEGRA	Integration	The degree to which a student participates in primary or quasiprimary relationships (has close friends).
ADVISOR	Advisor	The degree to which a student believes that his/her advisor is helpful.
FACREL	Faculty Relationship	The amount of informal contact with faculty members.
UGRADES	University GPA	The degree to which a student has demonstrated the capability to perform academically at an IHE.
CENT	Centralization	The degree to which a student believes that he/she participates in the decision making process.
HOUSING	Housing	Where a person lives while attending the IHE.
JOB	Campus Job	The number of hours a student works while at an IHE (and whether the job is related to the student's academic program).
CAMPORGS	Campus Organizations	The number of memberships in campus organizations.
USERV	University Services	The extent to which a student uses university services.
COURSES	Courses	The extent to which the courses a student wants to take are available.
DISTJUST	Distributive Justice	The degree to which a student believes that he/she is being treated fairly by the institution; i.e., receives rewards and punishments proportional to the effort expended in the student role.
APCOMP	Academic Program (Competitive)	The extent to which a student perceives his/her academic program is competitive.
APDEM	Academic Program (Demanding)	The extent to which a student perceives his/her academic program is demanding.

Table 1
Definition of Variables (Continued) - 45 -

Variable Label	Variable Name	Definition
PERSONAL VARIABLES		
GOALCOM	Goal Commitment	The degree to which obtaining the bachelor's degree is perceived as being important.
MAJCERT	Major (Certainty)	The degree of certainty that a student has that he/she will graduate with a major in a specific academic discipline.
OCUCERT	Occupational (Certainty)	The degree to which a student is certain of what his or her occupation will be.
CONF	Confidence	The confidence a student has in being able to be a successful student.
ENVIRONMENTAL VARIABLES		
OPPORTTR	Opportunity (Transfer)	The degree to which alternative roles as a student are perceived as existing in the external environment.
OPPORTJB	Opportunity (Job)	The degree to which alternative roles as an employee are perceived as existing in the external environment.
FAMAPR	Family Approval	The extent to which a student believes that his/her parents approve of the student's educational program.
FAMRESP	Family Responsibility	The degree of an individual's kinship obligations while attending an IHE.
MARRY	Marriage	The likelihood that a student will marry before graduation.
MONEY	Money to Finance an Education	The ease with which a person is able to pay for one's education.
BACKGROUND VARIABLES		
POPED	Father's Education	The amount of formal education a student's father received.
MOMED	Mother's Education	The amount of formal education a student's mother received.

Table 1
Definition of Variables (Continued)

Variable Label	Variable Name	Definition
PERFORM	Performance	The degree to which a student has demonstrated academic achievement before entering an IHE.
HSSIZE	High School Size	The size of the graduating class in the high school from which the student graduated.
HOMETOWN	Hometown Size	The size of the community where the student spent most of his/her time growing up.
HOMEDIST	Distance Home	The distance to a student's parents' home.
STATRES	State Resident	Being a resident of the state where the IHE is located.
CONTROL VARIABLES		
CLASS	Class in School	The student's class rank -- Freshman, Sophomore, Junior, Senior, Special, Other.
SEX	Sex	The student's sex -- Male or Female.
AGE	Age	The student's age.
MARITAL	Marital Status	Being married, single, divorced, widowed, or separated.
FULLPART	Full Time or Part Time Status	Being registered for more than a certain number of semester hours.
TRANSFER	Transfer	Having attended another IHE as a full time student.
COLLEGE	College or Major	The student's field of study.
FOREIGN	Foreign	United States citizenship.
SEMNUMB	Semester Number	The number of semesters a student has attended the IHE.
RACE	Race	The student's race or ethnicity.
PARINCOM	Parents' Income	The income of the student's parents.